



The SUBSEA newsletter

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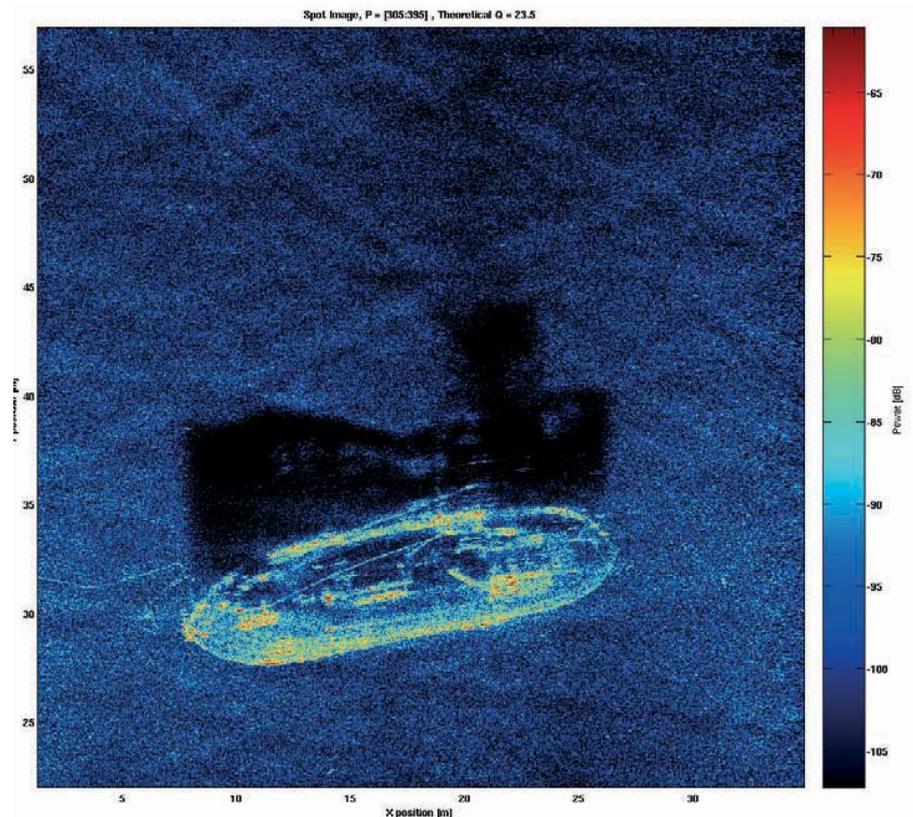
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First field results for the new Kongsberg HISAS Synthetic Aperture Sonar

Synthetic aperture sonars combine a number of acoustic pings to form an image with much higher resolution than conventional sonars, typically 10 times higher.

The HISAS sonar is part of the HUGIN system solution for mine countermeasures, which has been ordered recently by the Norwegian Navy. HISAS is a wideband SAS sonar with frequency range of 70-100kHz, capable of producing ultra high resolution acoustic images as well as co-registered bathymetry. The sonar is tightly integrated with the INS navigation and motion sensing platform of the HUGIN AUV, and makes use of

modern signal processing such as DPCA (Displaced Phase Centre Analysis) to process the raw data into images.

The sonar prototype has recently been tested with success at sea outside Horten, with signal processing done by FFI. The image above is from this test and shows a sunken wreck standing upright on the bottom. It has a resolution of about 4 cm both along track and across, each acoustic beam being processed from 40 consecutive pings. If the reproduction of the image is good, one can observe details such as the wire running from the bow to the top of the mast.

The 'Priz AS-28' Russian submarine crew safely rescued



In response to a call for assistance a Royal Navy Submarine Rescue Service Remotely Operated Vehicle (ROV) arrived in Petropavlovsk-Kamchatsky, off Russia's far eastern Kamchatka peninsula, on Sunday 7th August 2005. Its task was to assist in the rescue of the 'Priz AS-28' submarine and its crew of

seven Russian submariners trapped 625 feet down on the icy Pacific Ocean floor, with a rapidly diminishing air supply.

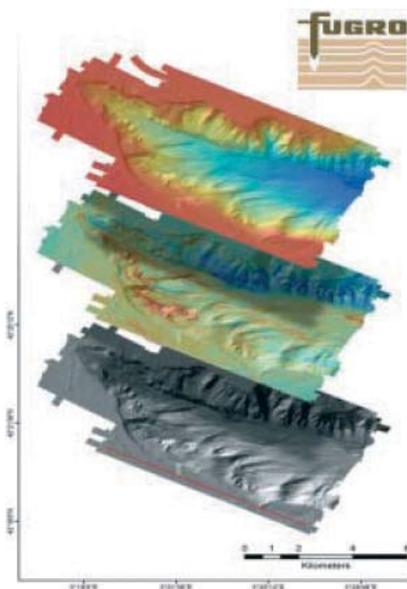
The ROV, fitted with Kongsberg Maritime cameras and transponders, spent five hours cutting away at the fishing net cables that prevented the subma-

rine from surfacing. When the final net was cut, the ROV was recovered and the Priz AS-28 immediately blew its tanks surfacing three minutes later. The crew opened the hatch themselves and climbed out unaided from the submarine.

Royal Navy Commander Ian Riches praised his ROV operators, and thanked the Royal Air Force for delivering the ROV and its crew, and all the contractors involved with the UK Submarine Rescue Service who make this international capability a reality.

Mike Topp from Kongsberg Maritime in Waterlooville, UK said, "We are delighted that our equipment has been used to such great effect in this important international rescue operation. It is reassuring that the world's navies had met only recently to discuss international collaboration on submarine rescue and we are relieved to hear that the Priz AS-28 crew is safe. We commend all those involved in the rescue."

Fugro in unprecedented detail



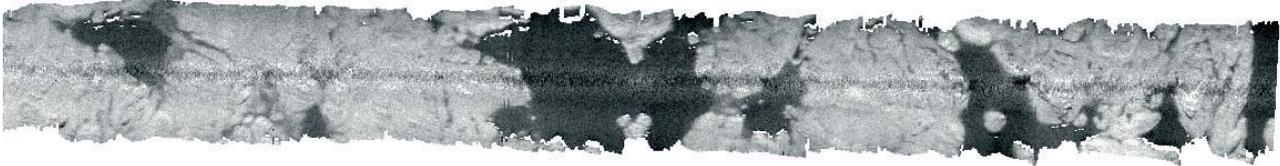
Fugro Survey Ltd and AOA Geophysics Inc have mapped the Cap de Creus canyon head, northeast of Barcelona, acquiring a data set that demonstrates Fugro and AOA's extensive capabilities with hull-mounted multibeam systems.

The map data clearly shows a wide range of active geologic processes, from mass wasting and furrows, to faults and sea-floor seepage, in unprecedented detail.

The Cap de Creus canyon head is the subject of an ongoing Euro STRATAFORM study supported by the European Community and the US Office of Naval Research. Dr Tom Drake, team leader for the Office of Naval Research's Coastal Geosciences Program, said, "I am more than pleased with the preliminary data I've seen so far and totally amazed that you were able to get all the necessary logistics lined up in a very short time. Nothing beats real professionals for getting the job done." The data were acquired with a hull-mounted Kongsberg EM 300 30kHz system (1x1 degree configuration) on Fugro's Geo Prospector. Northwest-southeast lines were run approximately parallel to the canyon axis, at speeds varying from 6.5 to 8 knots. The beam configuration was controlled

to ensure a high ping density at all water depths. The resultant shaded relief bathymetry has been created with a grid spacing of 10m. No interpolation or smoothing has been applied to the data. In the shallower water portions of the field area (<150m), the grid spacing is 5m. The furrows in the east central part of the field area are 20-50cm deep, and 20-50m apart. These features are smaller than the advertised accuracy of the system, and attest to the ability to image geologically relevant features with bin sizes significantly smaller than the footprint of individual beams. Fugro and AOA have, together and separately, been involved in a number of proprietary survey programmes for the oil industry. If 2D seismic data is acquired along with multibeam, Fugro and AOA are able to survey 250km² per day, or 100-line km of seismic. If 2D data is not acquired, Fugro and AOA are able to survey more than 800km² per day. Both companies utilise Kongsberg Maritime multibeam systems.

EM 710 Multibeam system for "Matthew" of CHS



Seabed imagery collected by EM 710.



"Matthew" in drydock, with transducer blister.

The EM 710 wideband multibeam echo sounder was installed and commissioned on the ship "Matthew" belonging to the Canadian Hydrographic Services this

spring. A full set of transducers for 0.5 x1 degrees was installed in a blister, but at this stage only with firmware and electronics to support a more modest resolution of 2x2 degrees.

The system replaces an EM 1002 multibeam system and will be used for hydrographic mapping in Canada, possibly also for fisheries research because of its water column imaging capability. The system was subject to extensive field testing by Professor John Hughes Clarke of the Ocean Mapping Group at University of New Brunswick. Since John has considerable expertise and experience with

multibeam echo sounders, this was exciting and interesting both for CHS and for Kongsberg Maritime. The acoustic performance was in fact probably better than expected, and will improve even further when the system is extended to its full capability.

Comment from Gary Rockwell, CHS: "Yes, the results from the 710 have been impressive. The start up went very well for a brand new system and the data seems far superior to anything we have seen before. The volume of data will challenge our systems but fortunately it is very clean and should not require a lot of processing."

Century Subsea Invests in New Technologies for Subsea Construction



Jan Garmulewicz (left) and Trevor Hughes (right)

Century Subsea is welcoming the delivery of its first, with an option for a second, Kongsberg Maritime Subsea HAIN, (Hydroacoustic Aided Inertial Navigation), prior to the commencement of a 90 day project in the Gulf of Mexico, for a major oil company.

Century Subsea is a global leader in the

use of new technologies to assist and advance project accuracies and efficiencies.

"Century is pleased to be promoting new technologies, at the behest of industry demands from the major oil companies," commented Jan Garmulewicz, Century Subsea Vice President, Americas. "Working closely with Kongsberg Maritime has been an interesting and fruitful exercise for all involved."

Subsea HAIN, developed from the successful HUGIN AUV navigation system, has now been used in several deepwater projects to enable increased accuracy of underwater positioning with minimal subsea hardware thus significantly reducing subsea construction costs.

Additionally, Century Subsea has also purchased a new generation HiPAP 350P (Portable) USBL System. This is another example of the forward thinking policies

in place within Century SubSea to harness new technologies to produce a better end result for the clients.

Trevor Hughes, Century Subsea Commercial & Marketing Manager commented: "One of the factors influencing Century Subsea to purchase the Kongsberg Maritime HiPAP 350P was the advantage of having the technologies developed for the HiPAP product line in a portable, easy to mobilise package. It enables flexibility in the use of this technology on vessels of opportunity as and when the need arises."

The HiPAP 350P has the pitch and roll sensor mounted in the transducer head providing the optimal solution for minimising movement in the system.

Century Subsea has also been using Kongsberg's MPT 341 DuB "shorties", with their modular functionality on a deepwater project in West Africa.

Kongsberg Maritime Crude Oil Measurement System Selected for De Ruyter Gravity Based Structure

Petro-Canada is the operator of the De Ruyter field in the Dutch Sector. Kongsberg Maritime AS is contracted by Heerema Zwijsdrecht BV in Holland which is building the Gravity Based Structure (GBS) to deliver the complete system for measurement of Crude Oil in GBS.

This Crude Oil Measurement System (CLM) is the most comprehensive delivery with level measurement in 20 crude oil storage tanks. A Skirt Penetration Monitoring System is also a part of the contract and will be used during the installation of the GBS.

Kongsberg Maritime has upgraded and improved the Crude oil interface Level Measurement (CLM) system. This system is capable of detecting the different interface levels in storage tanks using standard echo sounder technology and improved calculation methods. The system is used in subsea oil storage tanks, storage tanks on board tankers, onshore oil, diesel, water tanks etc. It is currently operational on several platforms in the North Sea.

Figure 1 illustrates the principle of open storage, and shows one storage tank and a buffer cell. Crude oil filled into the top

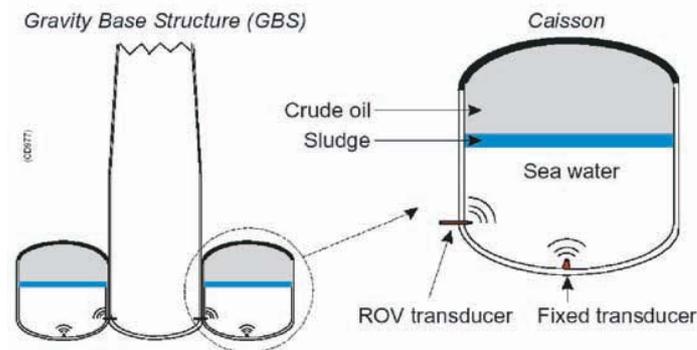


Figure 1. The CLM system

of the tank floats on the top of a water pillow. When crude oil is filled into the tank, water is displaced out of the tank via the buffer cell and treated on the topsides facility prior to disposal. When crude oil is drained off from the top of the tank, sea water replaces the volume of crude oil that is removed.

The Crude oil interface Level Measurement system uses acoustics to detect the position of the different interface levels in each of the independent storage tanks. Based on these measurements, the system calculates the volume of crude oil and emulsion in the tank. The operator may also visually detect the presence of gas build-up in the top of a tank. Only acoustic transducers

which contain no active components are placed subsea in the storage tanks. The transducers are connected with cables to Transceiver and Multiplexer Units located in an instrument room. An Operator Unit located in the platform control room or in an instrument room communicates with the Transceiver and Multiplexer Units via an Ethernet line.

A high performance echo sounder system is used to measure the position of the crude oil and emulsion interface levels. Information about interface levels in each tank is available as telegrams on a serial line to an external data acquisition system (DCS). The crude oil and emulsion information is presented as a percentage of the total volume in each of the tanks.

Hydrographic Multibeam System to Regional Public Company for the Inner Navigation

With the recent running of the Neptune and CFloor training courses, Kongsberg Maritime Srl. in Italy has now completed the supply of a Hydrographic Multibeam System to Regional Public Company for the Inner Navigation (ARNI).

The system includes EM 3000D, Seapath 200, Post processing Software Neptune/CFloor and full installation of the system on a new built Work Boat, performed by a technician from Kongsberg Maritime Srl.

ARNI is located in Boretto (near Parma), on the bank of the river Po. With its length of 652 km the Po is the main



Italian river and is navigable for 300 km, making it also the main Italian internal waterway. Having operated before now with singlebeam echosounders, the acquisition of this new multibeam system has allowed ARNI to make a remarka-

ble quantum leap in the execution of its institutional activities, which consist in the continuous monitoring of the river, planning of dredging, maintenance of infrastructure and all the activities related to the safety of navigation.

Additional multibeam capability for the UK Royal Navy

This year has seen the successful commissioning of five additional hydrographic multibeam systems on the UK Royal Navy vessels HMS Gleaner, HMS Endurance, HMS Roebuck and SMB Nesbitt along with the HMTG vessel SMB Owen.

Delivery has included the latest generation Kongsberg EM 710 medium depth multibeam system along with the new shallow water Kongsberg EM 3002 systems and the established Kongsberg EM 1002 system.

All vessels also have single beam capability provided by either the Kongsberg EA 400 or EA 600 systems. Topside real-time operation and post processing is provided through the latest Kongsberg SIS (Seafloor Information System) software and the established Kongsberg post



Picture of HMS Gleaner courtesy of UK Royal Navy

processing software suite of Neptune, Poseidon and Triton. Additional planning capability and data management and storage are provided by the Kongsberg PL10 system and the Kongsberg MDM 400 system respectively. The

newly commissioned systems will complement the existing integrated survey systems provided by Kongsberg Maritime on HMS Echo, HMS Enterprise, SMB Pioneer and SMB Pathfinder.

EM 3002 demonstration in North Vietnam

In mid May 2005 KM Singapore was approached by Mr Hao, Director of the Marine Safety Assurance Company No.1 (MSAC1) from Hai Phong, Vietnam and promptly agreed to conduct the first ever known shallow water multibeam echosounder demonstration in North Vietnam.

Equipment for the demo included the EM 3002 MBES, SIS visualization & acquisition software, Seapath 20 heading/position solution and an MRU H Motion Sensor.

The system was installed from scratch in an over-the-side mount configuration (including all fabrication and welding work) in just over 1 day on MSAC1's vessel, the Tien Sa. This duration was achieved due to the resourcefulness and dedication of MSAC1's experienced workforce who toiled late into the night to ensure all was ready for the demo.

Being the first ever known MBES demo in North Vietnam, there was significant interest from many parties, including the prestigious Vietnam Navy, the Hai Phong Port Authority, as well as the Sea Survey



and Mapping company (Seamap) who provide local expertise in hydrographic applications. These organisations, with the kind approval of MSAC1, were permitted to board the Tien Sa to witness the demonstration.

Following the initial calibration the vessel sailed on from the Red River in Hai Phong to Ha Long Bay, often referred to by the locals and foreigners alike as the

eight wonder of the world, and certainly one of the most beautiful parts of S.E. Asia.

Our thanks goes out to MSAC1 for the delightful hospitality and facilitation of the demonstration vessel, to Seamap for their assistance during the demonstration, and to our local representative for this customer, Sinh Company, for their support in all aspects.

Fugro "Echo Surveyor" Joins BP for West Nile Delta AUV Survey



The Kongsberg Maritime developed HUGIN 3000 owned by Fugro, "Echo Surveyor" will play a key role in BP Exploration (Egypt) Limited's regional AUV Hydrographic and analogue geophysical survey over the West Nile Delta concession, offshore Egypt.

Fugro Survey Limited in Aberdeen, UK is pleased to have been chosen by BP for this prestigious project to survey more than 7,000 survey line kilometres in water depths between 150m and 2000m. It will be the largest survey ever undertaken by Autonomous Underwater Vehicle (AUV) and is scheduled to take 3 months to complete.

Fugro Egypt will undertake an extensive

programme of Ultra High Resolution (UHR) seismic survey using its vessel, M/V Western Shore.

Fugro is able to offer BP access to geohazard site investigation expertise and a wealth of local interpretation experience for BP's planned developments in the West Nile Delta. Fugro will work closely with BP to produce a comprehensive report covering all aspects of geohazard risk in the development. The proven reporting production procedures which were developed for BP's Plutonio field development in Angola, ensure timely report deliverables.

For the AUV survey, Fugro will use its tried and tested dedicated survey vessel, M/V Geo Prospector, as survey platform for the new Echo Surveyor HUGIN 3000 Autonomous Underwater Vehicle (AUV).

Echo Surveyor will use an EM 2000 200 kHz Multibeam echosounder and an Edgetech Full Spectrum Chirp seafloor mapping system (sidescan sonar and sub-bottom profiler) to provide detailed

images of seabed and sub-surface conditions over the West Nile Delta terrain.

The Echo Surveyor's tightly coupled inertial navigation system adds rigour to the positioning of hazards and features. The tight turning circle - Echo Surveyor can turn almost in its own length - enormously reduces the time to change between survey lines. It would take more than a year to complete this survey using traditional towed technologies.

The benefits to the Client in using Echo Surveyor are numerous:

- Improved data quality and positioning accuracy enables a confident interpretation of seabed and sub-seabed conditions.
- Confident interpretation permits assured engineering that reduces risk and reduces cost.
- Faster data acquisition combined with tried and tested onboard reporting routines with high speed satellite data link delivers faster results to the asset team.
- Faster results delivery can reduce development time and bring forward oil field revenue

New Upgrade and Maintenance Contract with US Navy

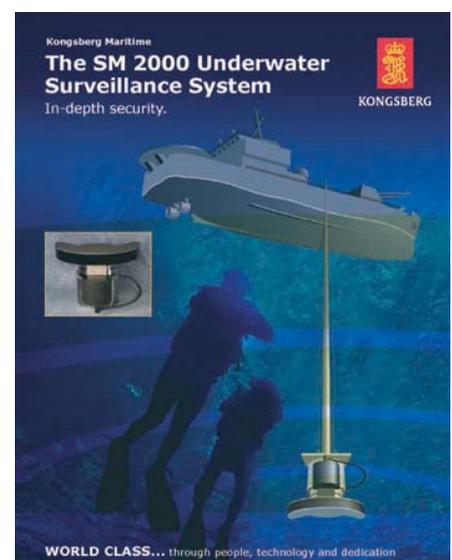
Kongsberg Maritime's Lynnwood, USA based division, Kongsberg Underwater Technology, Inc., has been awarded a \$2.1 million contract for the upgrade and maintenance of the U.S. Navy's existing Kongsberg SM 2000 Underwater Surveillance Systems.

The contract is with the Space and Naval Warfare Systems Center, San Diego and provides for the ongoing maintenance and upgrade of existing systems over the next five years. It follows a \$3 million order in May 2005 for the delivery of an additional 10 SM 2000 systems for the U.S. Coast Guard's Integrated Anti-swimmer System (IAS).

The SM 2000 Underwater Surveillance System is manufactured by Kongsberg

Mesotech Ltd, Port Coquitlam, British Columbia, Canada. The system is designed to track and process underwater threats in order to provide alarms for operators to act on. The system uses Sonar to detect and differentiate between divers and other targets such as marine life and debris.

"The SM 2000 is a well proven, highly accurate system that utilizes advanced hydroacoustics to detect underwater targets," says Duane Fotheringham, engineering project manager. "The system meets the current needs of the U.S. authorities for port security and this upgrade and support contract will ensure that it continues to provide the high level of performance and accuracy required."



Kongsberg and Simrad to supply the 'The Full Picture' to newbuild Spanish research vessels



Demonstrating the scope of the 'Full Picture', Simrad Spain SL has announced the signing of the public tender contract with M. Cies Shipyards in Vigo for the supply of navigation and hydroacoustic equipment for two new fishery research vessels. The contract was signed on behalf of the Secretaria General de Pesca, for vessels belonging to the Spanish Fishery Ministry, and will assist in the creation of a bigger, more modern fleet for the Spanish Research Institution.

Several reasons including complete integration, similar project references and local support capability factored in Kongsberg and Simrad being chosen for the contract. Additionally, the Secretaria's previous experience with Simrad, onboard the 'R/V Vizconde de Eza' played a large part in the choice of the extensive package. With equipment from six Kongsberg Maritime and Simrad departments, the new research vessels will be more than capable of continuing the excellent work already carried out by the 'R/V Vizconde de Eza'.

The largest vessel of the two will be a 70m multipurpose vessel due for delivery at the end of 2006. It will conduct full ocean research operation and be equipped with:

Scientific Equipment with Kongsberg Seatex Seapath 200, Kongsberg Multibeam Echosounder EM 3002, Marine Data Management MDM

400, Hydrographic Echosounder EA 600, Simrad EK60 Multifrequency Echosounder, Net Sounder ITI, Net Sonar FS20/25, Synchronising Unit SSU, Kongsberg Defence & Aerospace TOPAS PS18, ADCP.

Integrated bridge navigation from Simrad and Kongsberg Maritime including autopilot AP50, gyro CG80, AIS AI80, SART SA90, electronic chart system CS56 and communications, Radars DB10 and Voyage Data Recorder MMB. SDP10 Dynamic Positioning.

A 27m vessel for coastal continental shelf studies (SPACE project) will be delivered at the end of 2005 and will be equipped with:

Scientific Equipment with Kongsberg Maritime EM 3002 D multibeam echosounder, Kongsberg Maritime Hydrographic Echosounder EA 600, TOPAS PS40, Kongsberg Seatex Seapath 200, sound velocity sensors and dGPS receivers.

Simrad Fishery Sonar SH40, EK60 Multifrequency Echosounder, Net Sounder ITI. Bridge navigation from Simrad including autopilot, radar, gyro, electronic chart system and communications.

In addition to the supply of navigation and scientific equipment, the contract also covers the full commissioning and training for both vessels. This requires close collaboration between Kongsberg

Maritime and its subsidiary Simrad, and the various departments from each company. Additionally, a high level of collaboration between the involved parties (owner, shipyard, engineering offices and supplier) has been achieved, which has generated big expectations on the success of the project.

Simrad Spain SL has a strong pedigree in the supply of navigation and scientific equipment to Spanish research vessels. Since 1997, the company has supplied both Kongsberg Maritime and Simrad equipment to R/V 'Hespérides' for the High Research Council (CSIC), R/V 'Vizconde de Eza' for fishery research, R/V 'Cornide de Saavedra' and R/V 'Fco. de Paula Navarro' for Oceanographic Institute, and H/V 'Tofiño', H/L 'Astrolabio' and H/L 'Escandallo' for Navy Hydrographic Institute.

Operation Support US



Brett white assisting in a HPR 410P mobilisation in Houma Louisiana

Kongsberg Maritime is pleased to welcome Brett White to the Operation Support Department, Brett who is based in Houston has a wide experience in the Subsea Construction and Seismic industry. He will assist in Kongsberg Maritime's product range for applications, procedures, reporting, training and technical assistance.

Training for the future

One of the biggest factors affecting the subsea & construction industry at present is the shortage of skilled offshore staff such as Surveyors, Survey engineers & ROV pilots. Now is the time to ensure that this most valuable resource, surveyors & survey/ROV technicians, are properly trained. They will then be able to take advantage of the new technologies & innovative applications available by maximising the use of your Kongsberg Maritime acoustic positioning systems.

After all, you have paid for them! Maximise their use.

Training personnel, for instance, on the HiPAP operating software, APOS, and its associated systems, takes a few days, costs hundreds of \$'s - but can save you hundreds of thousands \$'s.

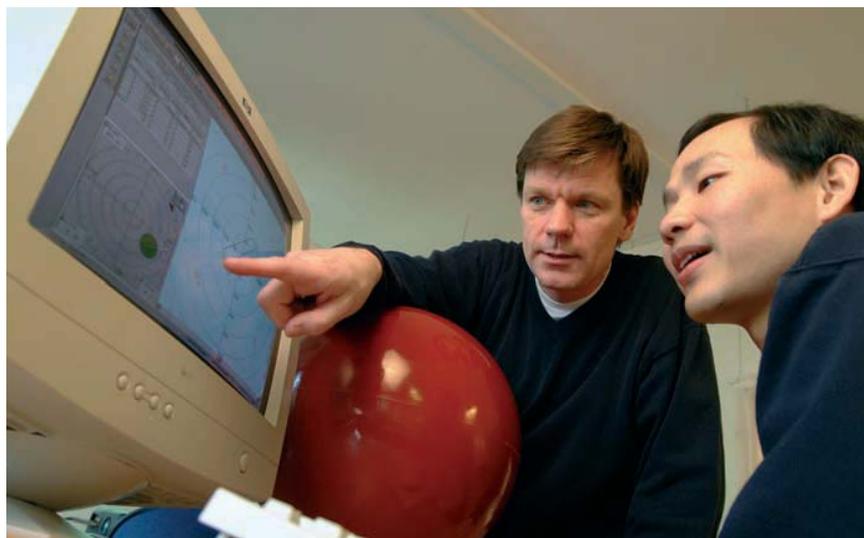
Added benefits

Time must be allocated for training as the benefits are too important to be ignored:

- Competitive advantage
- Reduced risk
- Cost savings
- Maximising operations using existing resources
- Project preparation & planning
- Development of new methods of working
- Internal transfer of skills
- Retention of valued staff & development of new entrants

System awareness

The need for training those personnel who have to operate the various systems offshore is self-evident. However, it is also very important that project managers and those responsible tendering for contract work are aware of the full capability of the Kongsberg Maritime systems, which represent a significant



capital investment on board their vessels. Application of the latest technologies such as Hydroacoustic Aided Inertial Navigation, (HAIN), & combined ROV & Multibeam operations can deliver operational savings that make training costs totally insignificant. But first you must be competently trained!

Kongsberg provide system awareness training for this group of staff to ensure that the competitive advantages available, by maximising the use of systems such as HiPAP & HAIN are fully understood. By correctly operating these systems, valuable vessel time and cost savings can be achieved, with a reduction in the operational risk.

Shared knowledge

Many training courses are conducted by instructors who have experience of subsea construction projects. They will share their knowledge with delegates both during the course and afterwards through Operational Support on specific projects.

Kongsberg training allows companies to operate effectively with an enlarged

skill pool, albeit the same number of staff. Training centres have been established in Horten in Norway, Aberdeen in the UK, Houston in the USA & Macae in Brazil complete with modern and comfortable classrooms equipped with the same computers and bridge consoles found offshore.

Courses available include:

- APOS for Surveyors
- HiPAP Technical for Survey Engineers
- Dynamic Positioning – Introduction/Advanced
- HPR & HiPAP Acoustic Positioning LBL & Multi-user LBL
- Multibeam Echo Sounder - Operators
- Multibeam Maintenance - Technicians
- Multibeam Data Post-processing - Operators
- Seafloor Information System - Operators
- Seapath Operation
- Hydroacoustic Aided Inertial Navigation (HAIN) Theory & Operation
- Vessel Reference System – DARPS & RADIUS

Kongsberg Maritime training is an investment that allows you to maximise your marine construction performance”



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